

California State Polytechnic University, Pomona

Chem 315
Midterm Exam
Winter, 2012
Beauchamp

Name: _____

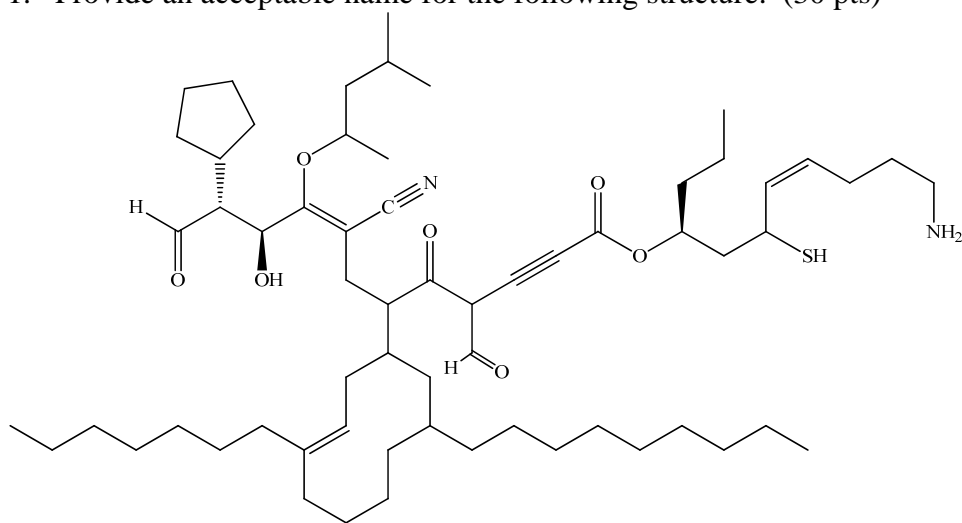
Topic	Total Points	Credit
1. Nomenclature (1)	30	
2. Tautomeric mechanisms, arrow pushing, proton transfers, resonance, one in acid and one in base	30	
3. Nucleophile and electrophile reactions	36	
4. Reactions Page	30	
5. Multistep syntheses using the reactions learned thus far in the course	30	
6. Complete details of $S_N1/E1$ and $S_N2/E2$ reactions. Stereochemistry, arrow pushing, carbocations, rearrangements might be part of the problem	30	
7. Complete arrow pushing mechanisms, (acid & base)	30	
Total	216	

This is a long exam. It has been designed so that no one question will make or break you. The best strategy is to work steadily, starting with those problems you understand best. Make sure you show all of your work. Draw in any lone pairs of electrons, formal charge and curved arrows to show electron movement. Only write answers on the front of each page. Do your best to show me what you know in the time available.

You must do the thing you think you cannot do. Eleanor Roosevelt

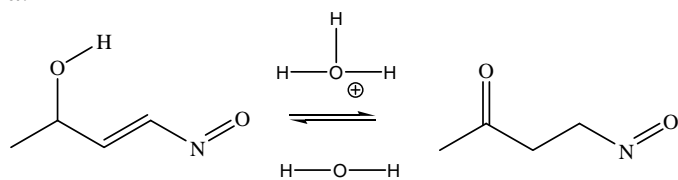
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1. Provide an acceptable name for the following structure. (30 pts)

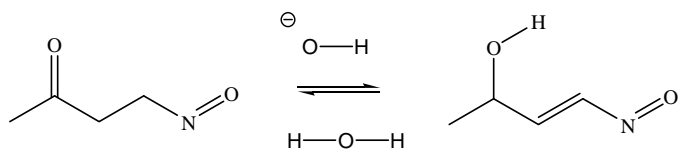


2. Provide a complete arrow-pushing mechanism (curved arrows, lone pairs and formal charge) to explain the following tautomeric transformations. (30 pts)


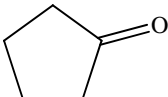
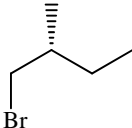
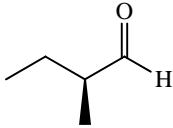
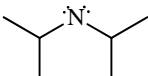
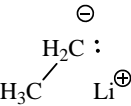
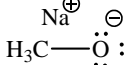
a.



b.



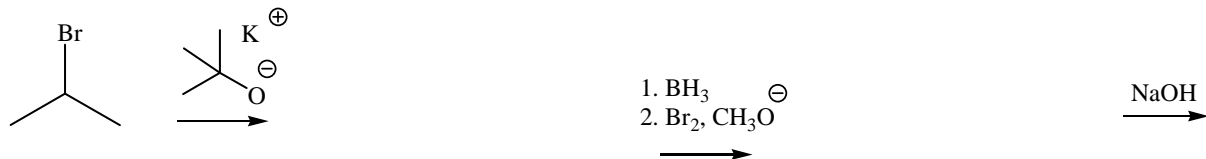
3. Fill in the expected “major” product(s) from the nucleophile/electrophile combinations. Assume a workup step where necessary. For equilibrium reactions, write the equilibrium product(s). (36 pts)

substrates				
reaction conditions				
$\text{H}_3\text{C}-\overset{\oplus}{\text{O}}(\text{H})-\text{H}$ $\text{H}_3\text{C}-\ddot{\text{O}}-\text{H}$				
Li^{\oplus} 				
				
$\text{:N}\equiv\text{C:}^{\ominus}$ Na^{\oplus}				
$\text{H}_3\text{B}^{\ominus}-\text{H}$ Na^{\oplus}				
Na^{\oplus}  $\text{H}_3\text{C}-\ddot{\text{O}}-\text{H}$				

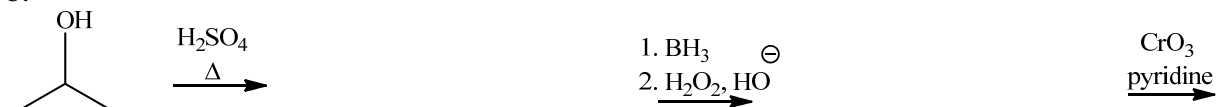
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4. Fill in the missing product or reagent, as needed, for each reaction below. Do not waste time by writing mechanisms or thinking too much on any one part. (30 pts)

a.



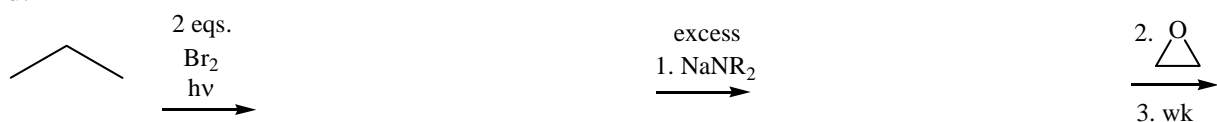
b.



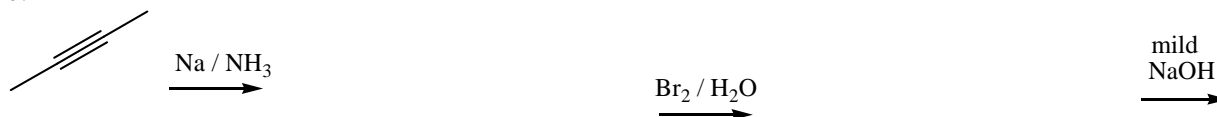
c.



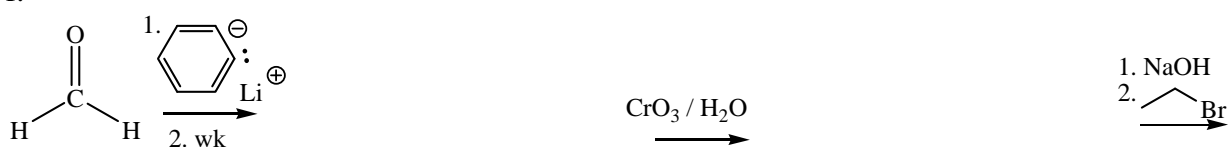
d.



e.



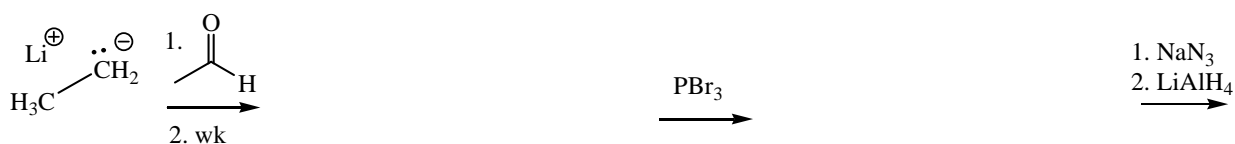
f.



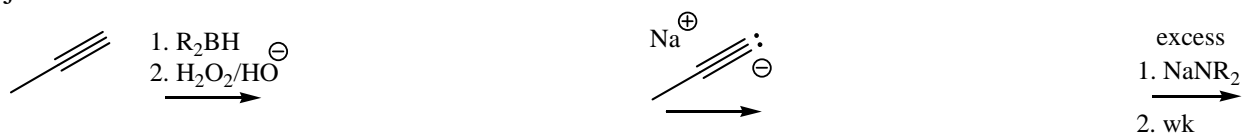
g.



h.


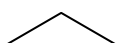


j.

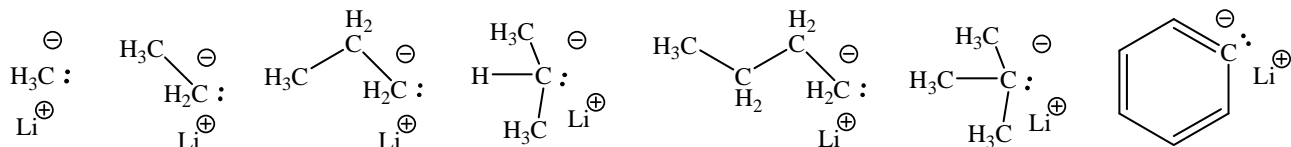


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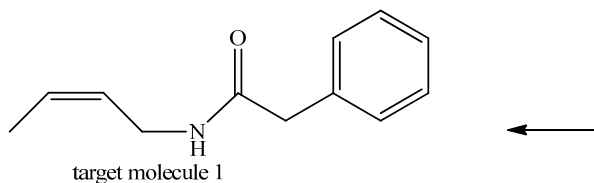
5. Propose a reasonable synthetic method to accomplish the following transformations using the given structures and any additional materials available from our course. Show a reaction arrow with appropriate reagents and the product for each step of your synthesis. Do not show mechanisms. (30 pts)

Given alkanes: CH_4  

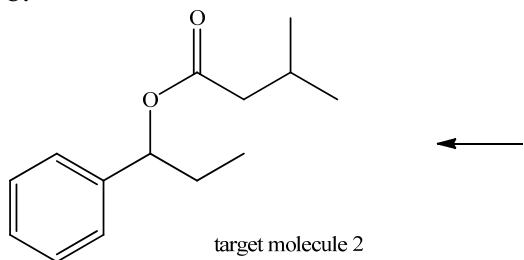
Given organolithium reagents:



a.



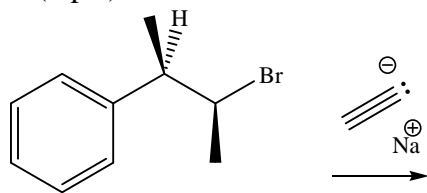
b.



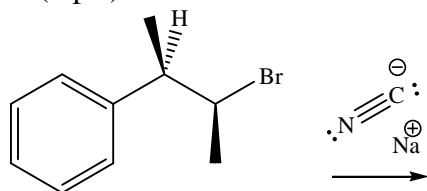
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6. Indicate the major reaction mechanism in each reaction below and write an arrow-pushing mechanism, using 3D structures. Assume that if a more stable intermediate can form, it will generate the major product(s). If multiple products form by one type of mechanism, just show the mechanistic sequence for the major product and draw the other expected products. (30 pts)

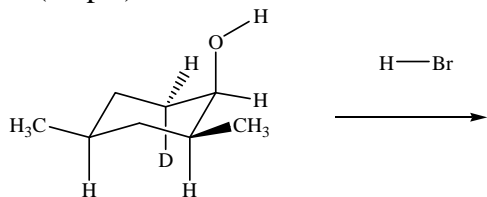
a. (5 pts)



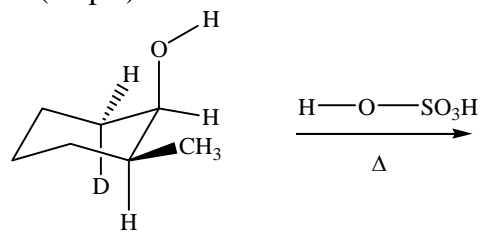
b. (5 pts)



c. (10 pts)

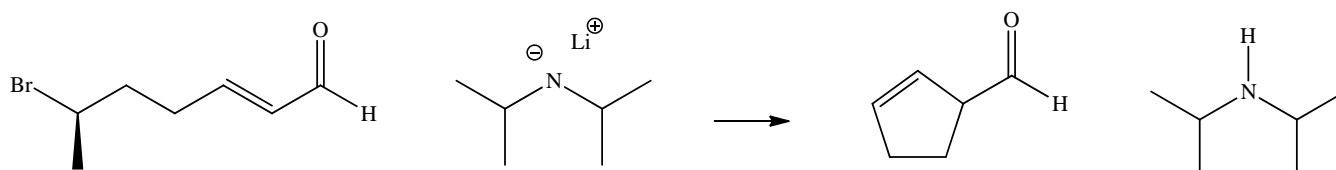
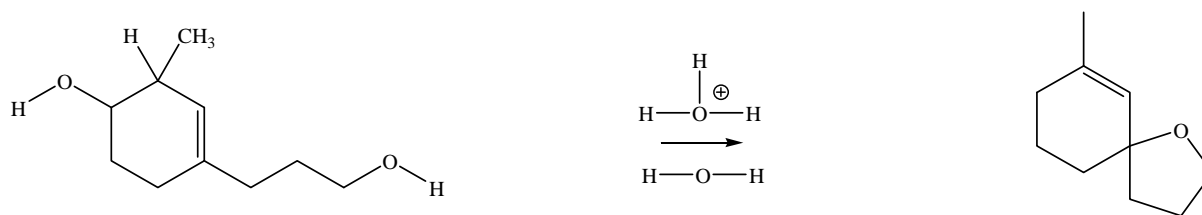


d. (10 pts)



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7. Provide complete arrow-pushing mechanisms for the reactions below. Include curved arrows, lone pairs of electrons and formal charge for each step. If resonance is present, draw the best resonance structure and at least one additional resonance structure to show you recognize this feature. (30 pts)



Add in a missing methyl group with correct stereochemistry.